TASK 6. INVERTEBRATE COMPOSITION

6.1 OBJECTIVE

The purpose of the invertebrate composition surveys was to evaluate the spatial and temporal differences in prey availability for juvenile life stages of steelhead rainbow trout and chinook salmon.

6.2 INVERTEBRATE SAMPLING METHODS

Invertebrate drift and benthic samples were collected from the Mokelumne River in fall 1990 (26 September - 4 October) and spring 1991 (13-14 May). Five locations on the Mokelumne River were sampled: immediately below Camanche Dam, Highway 88 Bridge, Bruella Road, Woodbridge Golf Course, and DeVries Road. For analysis, these locations were grouped into three segments: upper (Camanche and Highway 88), middle (Bruella Road), and lower (Golf Course and DeVries Road) (Table 6.1).

Table 6.1. Number of drift and benthic invertebrate samples collected at each sampling location on the Mokelumne River during fall 1990 and spring 1991.

		FALL 1990		SPRING 1991	
SEGMENT	LOCATION	DRIFT	BENTHIC	DRIFT	BENTHIC
UPPER	Camanche Dam	6	10 (Surber)	2	2 (Surber)
	Highway 88	6	10 (Surber)	2	2 (Surber)
MIDDLE	Bruella Road	6	10 (Eckman)	2	2 (Eckman)
LOWER	Golf Course	6	10 (Eckman)	2	2 (Eckman)
	DeVries Road	6	10 (Eckman)	2	2 (Eckman)

Within each location, drift and benthic samples were collected in different aquatic habitats. In the fall of 1990, 6 day and night drift samples and 10 benthic samples were collected at each location. An equal number of samples were collected in riffles and runs at the Camanche and Highway 88 locations; however, samples from the middle and lower segments were collected in run habitat only since no riffles were present in these areas. In the spring of 1991, two day and night drift samples and two benthic samples were collected in each segment. All habitats sampled were runs except for Highway 88 where a deep riffle was sampled.

Two types of sampling methods were used to collect benthic fauna: a Surber sampler was used in gravel substrate and an Eckman dredge was used in sand or silt/mud substrate. The Surber sampler consists of a sampling frame (30 cm x 30 cm) attached to a conical net (30 cm wide x 30 cm high x 61 cm long) (1,024 μ mesh). The frame was placed over the substrate and all large cobbles and gravels within the frame were carefully cleaned and removed. Invertebrates from the cobble and fine substrate were washed into the net by the current. The finer substrate in the frame was stirred to dislodge the remaining invertebrates. The Eckman sampler consists of a dredge scoop (15 x 15 x 15 cm) with a spring-released bottom. The scoop was driven 15 cm into the substrate, the sampler jaws were closed, and the scoop withdrawn from the substrate.

For drift sampling, fine mesh nets (99.1 cm x 45.7 cm x 30.5 cm, 363 μ mesh) were used, manufactured by Wildco Wildlife Suppliers, Michigan. The fall sampling consisted of three nets anchored into the substrate with metal stakes and positioned evenly across the river at two sites per segment. To sample invertebrates in the water column as well as the surface drift, the nets were oriented with the net opening facing upstream; the nets extended vertically from the river substrate to above the water surface. The spring sampling was similar, but only the lower area of each segment was monitored using two nets spaced across the river. The nets were left in place for approximately 24 hrs and were checked, cleaned, and emptied twice during this sampling period. These checks were made as close to 12 hrs apart as possible. An effort was made to distinguish between day and night drift using the spring Highway 88 sample area by setting and checking the nets at sundown and sunrise.

All materials collected during drift and benthic sampling were placed in sample jars filled with denatured alcohol for later classification and analysis. Organisms in each sample were hand-sorted and identified to taxonomic family where possible. The biomass of invertebrates in the drift and benthic samples was determined by volumetric displacement in a 5-ml pipette.

For purposes of analysis and comparison, organisms were arranged into appropriate taxonomic groups (order or family). For comparison of benthic samples obtained by different methods, the surface area sampled by each technique (i.e., 900 cm^2 for Surber and 225 cm^2 for Eckman) were used. For drift samples, the volume sampled is dependent on flow, which varied during the study period; therefore, only the total number of invertebrates caught per sample were compared. Relative abundance of each taxonomic group was recorded and expressed as total number per sample (drift) or total number per m^2 (benthic). Total biomass was estimated by multiplying mean abundance values by the average weight of each invertebrate group.

6.3 RESULTS OF INVERTEBRATE SAMPLING

Invertebrate composition and relative abundance of taxonomic groups identified from the benthic samples collected from the upper, middle, and lower river segments, are given in Table 6.2. During the fall sampling, the benthic invertebrate fauna differed between sampling sections. Trichoptera larvae (52.1%), mainly *Hydropsychid* sp., and diptera larvae

(27.8%) (*Chironomid* spp.) were abundant at the upper sites (Camanche Dam and Highway 88). Oligochaeta (54.5%) and trichoptera larvae (22.3%) were numerous in the benthic samples from the middle (Bruella Road) segment. At the lower sites (Woodbridge Golf Course and DeVries Road), oligochaetes and freshwater clams (Pelecypoda) were numerically important, comprising 53.2 percent and 24.1 percent, respectively, of the total benthic fauna. The invertebrate fauna also differed by site in the spring samples. Diptera larvae comprised 54.5 percent of the invertebrate fauna at the upper sites and ephemeroptera nymphs (*Baetiidae*) comprised 21.4 percent. Diptera larvae (54.3%) and freshwater clams (29.0%) were numerous at the middle segment, while oligochaetes (53.8%) and freshwater clams (29.7%) were abundant at the lower sites.

The mean number of invertebrates and estimates of benthic biomass per square meter are presented in Table 6.3. During the fall, more invertebrates were collected in the lower river samples than in the other two segments. Invertebrate abundances in the upper and lower river were 3692.1/m^2 and 4259.6/m^2, respectively. In contrast, fewer individuals were collected in the middle (Bruella Road) samples (1,075.6/m^2). In the spring benthic samples, more invertebrates were observed in the upper section (7,255.6/m^2) than in the middle (3,066.7/m^2) or lower section (1,011.1/m^2) (Table 6.2).

Biomass at all benthic sampling locations was dominated by mollusks, which accounted for over 95 percent of the total biomass in all samples (Table 6.3).

The invertebrate composition and relative abundance of the taxonomic groups collected in the drift samples are summarized in Table 6.4. During the fall, both the upper and lower drift fauna were comprised mainly of diptera larvae (chironomid and simuliid) and trichoptera larvae (*Hydropsychid* spp. and *Hydroptilid* spp.). At the upper site, diptera larvae comprised 45.7 percent of the sample and trichopteran larvae made up 36.5 percent. At the lower site, 47.1 percent of the sample was diptera larvae and 24.8 percent was trichoptera larvae. Ephemeroptera (39.0%) and diptera larvae (21.0%) were abundant in the drift at the middle Bruella Road sites.

During the spring sampling, cladocerans (Branchiopoda) completely dominated the drift in the upper sites, comprising 90.6 percent of the total drift fauna. Ephemeropterans (52.1%) and oligochaetes (25.0%) were numerous in the spring drift at Bruella Road. However, diptera (31.1%), cladocerans (18.6%), ephemeroptera nymphs (15.5%), and clams (15.2%) (Pelecypoda) were all abundant in the drift of the lower sites (Table 6.4). Drifting invertebrates were more numerous in the upper sites during both sampling periods.

At the upper site, the overall mean number of individuals per drift sample was 1,173 in the fall and 1,145 in the spring (Table 6.5). However, fewer invertebrates were recorded from the drift in the lower sites (202/sample in the fall and 605/sample in the spring). Fewer invertebrates were found in the drift from the Bruella Road site during fall (115.7) and spring (24.0).

Table 6.2. Composition and relative abundance of invertebrates collected in benthic samples, fall 1990 and spring 1991.

CAMANCHE/HWY. 88		BRUELLA ROAD		GOLF COURSE/DEVRIES	
GROUP	PERCENTAGE	GROUP	PERCENTAGE	GROUP	PERCENTAGE
FALL					
Trichoptera	52.1%	Oligochaeta	54.5%	Oligochaeta	53.2%
Diptera	27.8%	Trichoptera	22.3%	Pelecypoda	24.1%
Ephemeroptera	13.0%	Diptera	15.7%	Diptera	15.7%
Lepidoptera	1.9%	Nematoda	3.3%	Gastropoda	1.8%
Oligochaeta	1.9%	Pelecypoda	2.5%	Nematoda	1.6%
Planariidae	1.2%	Hemiptera	0.8%	Planariidae	1.2%
Pelecypoda	0.7%	Ephemeroptera	0.8%	Trichoptera	1.0%
Other terrestrial insects	0.5%			Ephemeroptera	0.6%
Gastropoda	0.4%			*Hydra* spp.	0.3%
Malacostraca	0.3%			Acarina	0.2%
Nematoda	0.1%			Coleoptera	0.2%
Collembola	0.1%			Malacostraca	0.1%
Hemiptera	<0.1%			Branchiopoda	0.1%
SPRING					
Diptera	54.5%	Diptera	54.3%	Oligochaeta	53.8%
Ephemeroptera	21.4%	Pelecypoda	29.0%	Pelecypoda	29.7%
Trichoptera	14.3%	Oligochaeta	16.7%	Diptera	14.3%
Oligochaeta	4.4%			Collembola	2.2%
Planariidae	2.3%				
Malacostraca	1.4%				
Pelecypoda	0.9%				
Icthyoplankton	0.2%				
Gastropoda	0.2%				
Hemiptera	0.2%				
Lepidoptera	0.1%				

Table 6.3. Mean abundance (no./m^2) and biomass (g/m^2) of individuals in the benthic samples collected from the upper, middle, and lower river segments, fall 1990 and spring 1991. Standard deviations (SD) are reported in parentheses.

	FALL									SPRING								
	(CAMANCHE/HWY 88)			(BRUELLA ROAD)			(GOLF COURSE/ DEVRIES)			(CAMANCHE/HWY 88)			(BRUELLA ROAD)			(GOLF COURSE/ DEVRIES)		
	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass
ANNELIDA																		
Cl. Oligochaeta	71.4	(94.0)	0.1	586.7	(672.1)	0.9	2,266.7	(3,245.9)	3.6	319.4	(483.8)	0.5	511.1	(534.3)	0.8	544.4	(630.0)	0.9
ARTHROPODA																		
S.P. Chelicerata																		
Cl. Arachnida																		
O. Acarina	0.0	(0.0)	0.0	0.0	(0.0)	0.0	7.0	(30.6)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0
S.P. Crustacea																		
Cl. Malacostraca	11.1	(11.1)	<0.1	0.0	(0.0)	0.0	2.3	(10.2)	<0.1	100.0	(136.1)	<0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0
Cl. Branchiopoda	0.0	(0.0)	0.0	0.0	(0.0)	0.0	2.3	(10.2)	<0.1	13.9	(27.8)	<0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0
S.P. Uniramia																		
Cl. Insecta																		
O. Coleoptera	0.0	(0.0)	0.0	0.	(0.0)	0.0	7.0	(22.3)	<0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0
O. Collembola	3.2	(8.4)	<0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0	22.2	(44.4)	<0.1
O. Diptera	1,025.4	(632.5)	0.2	168.9	(211.8)	<0.1	669.0	(1,699.0)	0.1	3,952.8	(3,749.3)	0.6	1,666.7	(345.7)	0.3	144.4	(233.4)	<0.1
O. Ephemeroptera	479.4	(553.3)	0.2	8.9	(19.9)	0.0	25.7	(63.4)	<0.1	1,555.6	(2,791.8)	0.7	0.0	(0.0)	0.0	0.0	(0.0)	0.0
O. Hemiptera	1.6	(4.2)	<0.1	8.9	(19.9)	0.1	0.0	(0.0)	0.0	11.1	(9.1)	0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0
O. Lepidoptera	71.4	(133.6)	0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0	5.6	(6.4)	<0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0
O. Trichoptera	1,923.8	(1,388.2)	0.4	240.0	(536.7)	0.1	42.1	(103.1)	<0.1	1,036.1	(1,198.0)	0.2	0.0	(0.0)	0.0	0.0	(0.0)	0.0
Oth. Terr. Insects	17.5	(37.3)	<0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0
MOLLUSCA																		
Cl. Gastropoda	14.3	(12.4)	<0.1	0.0	(0.0)	0.0	77.2	(139.6)	0.5	13.9	(10.6)	0.1	0.0	(0.0)	0.0	0.0	(0.0)	0.0
Cl. Pelecypoda	25.4	(31.2)	23.4	26.7	(39.8)	24.6	1,026.9	(931.1)	947.5	66.7	(43.5)	61.5	888.9	(1,068.5)	820.2	300.0	(310.8)	276.8
CHORDATA																		
Ichthyoplankton	0.0	(0.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0	13.9	(21.0)	0.0	0.0	(0.0)	0.0	0.0	(0.0)	0.0

Table 6.3. Mean abundance (no./m²) and biomass (g/m²) of individuals in the benthic samples collected from the upper, middle, and lower river segments, fall 1990 and spring 1991 (cont.).

	FALL						SPRING					
	(CAMANCHE/HWY 88)		(BRUELLA ROAD)		(GOLF COURSE DEVRIES)		(CAMANCHE/HWY 88)		(BRUELLA ROAD)		(GOLF COURSE/ DEVRIES)	
	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
COELENTERATA												
Cl. Hydrozoa												
O. Hydroidae (*Hydra* spp.)	0.0 (0.0)	0.0	0.0 (0.0)	0.0	11.7 (51.0)	0.0	0.0 (0.0)	0.0	0.0 (0.0)	0.0	0.0 (0.0)	0.0
NEMATODA	3.2 (5.4)	0.0	35.6 (57.9)	0.0	70.2 (228.7)	0.0	0.0 (0.0)	0.0	0.0 (0.0)	0.0	0.0 (0.0)	0.0
PLATYHELMINTHES												
Cl. Turbellaria												
O. Tricladida												
F. Planariidae	44.4 (112.8)	<0.1	0.0 (0.0)	0.0	51.5 (194.4)	<0.1	166.7 (296.9)	0.2	0.0 (0.0)	0.0	0.0 (0.0)	0.0
TOTAL MEAN	3,692.1	24.6	1,075.6	25.7	4,259.6	951.8	7,255.6	63.9	3,066.7	821.3	1,011.1	277.7
LESS MOLLUSCS	3,652.4	1.1	1,048.9	1.1	3,155.6	3.8	7,175.0	2.3	2,177.8	1.1	711.1	0.9

Table 6.4. Composition and relative abundance of invertebrates collected in drift samples, fall 1990 and spring 1991.

CAMANCHE/HWY. 88		BRUELLA ROAD		GOLF COURSE/DEVRIES	
GROUP	PERCENTAGE	GROUP	PERCENTAGE	GROUP	PERCENTAGE
FALL					
Diptera	45.7%	Ephemeroptera	39.0%	Diptera	47.1%
Trichoptera	36.5%	Diptera	21.0%	Trichoptera	24.8%
Ephemeroptera	7.6%	Oligochaeta	13.0%	Ephemeroptera	11.3%
Branchiopoda	2.7%	Trichoptera	10.2%	Oligochaeta	3.3%
Pelecypoda	2.6%	Malacostraca	6.9%	Homoptera	3.2%
Malacostraca	2.6%	Branchiopoda	2.7%	Gastropoda	3.0%
Gastropoda	1.3%	Hemiptera	1.7%	Planariidae	2.3%
Oligochaeta	0.8%	Plecoptera	1.6%	Hemiptera	0.9%
Aerial Insects	0.3%	Gastropoda	1.2%	Malacostraca	0.7%
Hemiptera	0.2%	Araneae	1.0%	Copepoda	0.7%
Other Terrestrial Insects	0.1%	Copepoda	0.6%	Pelecypoda	0.4%
Plecoptera	0.1%	Pelecypoda	0.4%	Hymeroptera	0.4%
Planariidae	0.1%	Hymeroptera	0.3%	Crustacea	0.4%
Copepoda	0.1%	Odonata	0.1%	Lepidoptera	0.4%
Coleoptera	0.1%	Lepidoptera	0.1%	Coleoptera	0.3%
Odonata	0.0%			Odonata	0.2%
				Thysanoptera	0.2%
				Arachnida	0.2%
				Acarina	0.2%
				Branchiopoda	0.1%
				Collembola	0.1%
				Dermaptera	0.0%
				Hirudinea	0.0%
SPRING					
Branchiopod	90.6%	Ephemeroptera	52.1%	Diptera	31.1%
Diptera	4.1%	Oligochaeta	25.0%	Branchiopoda	18.6%
Oligochaeta	4.0%	Diptera	12.5%	Ephemeroptera	15.5%
Ephemeroptera	0.6%	Branchiopoda	4.2%	Pelecypoda	15.2%
Fish Larvae	0.3%	Hemiptera	2.1%	Copepoda	12.7%
Trichoptera	0.2%	Ichthyoplankton	2.1%	Aerial Insects	3.0%
Pelecypoda	0.1%	Trichoptera	2.1%	Gastropoda	1.7%
Planariidae	0.1%			Oligochaeta	0.6%
Hemiptera	0.0%			Hemiptera	0.5%
Plecoptera	0.0%			Fish Larvae	0.5%
				Malacostraca	0.3%
				Caleoptera	0.2%
				Trichoptera	0.2%

Table 6.5. Mean number and mean biomass (g) of individuals in the drift samples collected from the upper, middle, and lower river segments, fall 1990 and spring 1991. Standard deviations (SD) are reported in parentheses.

	FALL									SPRING								
	(CAMANCHE/HWY 88)			(BRUELLA ROAD)			(GOLF COURSE/ DEVRIES)			(CAMANCHE/HWY 88)			(BRUELLA ROAD)			(GOLF COURSE/ DEVRIES)		
	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass	Abundance		Biomass
ANNELIDA																		
Cl. Hirudinea	0.0	(0.0)		0.0	(0.0)		0.1	(0.2)		0.0	(0.0)		0.0	(0.0)		0.0	(0.0)	
Cl. Oligochaeta	9.3	(16.3)	0.01	15.0	(3.3)	0.02	6.6	(9.4)	0.01	46.0	(61.5)	0.07	6	(7.1)	0.01	3.5	(5.2)	0.01
ARTHROPODA																		
S.P. Chelicerata																		
Cl. Arachnida	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.3	(0.7)	<0:01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Acarina	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.3	(0.7)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Araneae	0.0	(0.0)	<0.01	1.2	(1.5)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
S.P. Crustacea	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.7	(1.5)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
Cl. Malacostraca	29.9	(46.4)	0.01	8.0	(7.1)	<0.01	1.5	(3.3)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	1.8	(2.4)	<0.01
Cl. Branchiopoda	31.8	(50.1)	0.02	3.2	(4.1)	<0.01	0.2	(0.7)	<0.01	1,037.5	(2,068.0)	0.52	1.0	(1.4)	<0.01	112.5	(225.0)	0.06
Cl. Copepoda	0.8	(1.8)	<0.01	0.7	(1.2)	<0.01	1.4	(4.7)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	77.0	(134.0)	0.04
S.P. Uniramia																		
Cl. Insecta																		
O. Coleoptera	0.8	(2.6)	<0.01	0.0	(0.0)	<0.01	0.6	(1.3)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	1.3	(1.3)	0.01
O. Collembola	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.1	(0.4)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Dermaptera	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.1	(0.3)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Diptera	528.7	(713.7)	0.08	24.3	(17.0)	<0.01	95.6	(67.0)	0.01	47.0	(24.1)	0.01	3.0	(2.8)	<0.01	188.0	(137.0)	0.03
O. Ephemeroptera	89.2	(79.0)	0.04	45.2	(14.0)	0.02	23.0	(61.0)	0.01	6.3	(6.7)	<0.01	12.5	(18.0)	0.01	94.0	(152.0)	0.04
O. Hemiptera	2.0	(4.4)	0.01	2.0	(4.4)	0.01	1.9	(3.1)	0.01	0.5	(1.0)	<0.01	0.5	(0.7)	<0.01	3.0	(6.0)	0.02
O. Homoptera	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	6.5	(12.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Hymeroptera	0.0	(0.0)	<0.01	0.3	(0.8)	<0.01	0.7	(1.1)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Lepidoptera	0.0	(0.0)	<0.01	0.2	(0.4)	<0.01	0.7	(1.5)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	·0.0	(0.0)	<0.01
O. Odonata	0.1	(0.3)	<0.01	0.2	(0.4)	<0.01	0.4	(1.1)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Plecoptera	1.3	(4.3)	0.01	1.8	(4.5)	0.01	0.0	(0.0)	<0.01	0.3	(0.5)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Thysanoptera	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.3	(0.9)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
O. Trichoptera	428.1	(476.7)	0.10	11.8	(6.4)	<0.01	50.3	(74.0)	0.01	2.5	(2.4)	<0.01	0.5	(0.7)	<0.01	1.0	(1.2)	<0.01
Other Terr. Insects	1.3	(3.1)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01
Other Aerial Insects	3.3	(11.3)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	0.0	(0.0)	<0.01	18.0	(36.0)	0.02

Table 6.5. Mean number and mean biomass (g) of individuals in the drift samples collected from the upper, middle, and lower river segments, fall 1990 and spring 1991 (cont.).

	FALL						SPRING					
	(CAMANCHE/HWY 88)		(BRUELLA ROAD)		(GOLF COURSE/ DEVRIES)		(CAMANCHE/HWY 88)		(BRUELLA ROAD)		(GOLF COURSE/ DEVRIES)	
	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass	Abundance	Biomass
MOLLUSCA												
Cl. Gastropoda	15.0 (15.5)	0.09	1.3 (1.4)	0.01	6.0 (6.7)	0.04	0.0 (0.0)	<0.01	0.0 (0.0)	<0.01	10.3 (12.0)	0.06
Cl. Pelecypoda	30.3 (33.1)	27.99	0.5 (0.8)	0.46	0.8 (2.0)	0.75	0.8 (1.5)	0.69	0.0 (0.0)	<0.01	92.0 (178.0)	84.89
CHORDATA												
Ichthyoplankton	0.0 (0.0)	<0.01	0.0 (0.0)	<0.01	0.0 (0.0)	<0.01	3.8 (2.5)	<0.01	0.5 (0.7)	<0.01	3.0 (1.6)	<0.01
PLATYHELMINTHES												
Cl. Turbellaria												
O. Tricladida												
F. Planariidae	1.3 (2.8)	<0.01	0.0 (0.0)	<0.01	4.7 (15.0)	<0.01	0.8 (1.0)	<0.01	0.0 (0.0)	<0.01	0.0 (0.0)	<0.01
TOTAL MEAN	1,172.9	28.37	115.7	0.55	202.9	0.87	1,145.3	1.30	24.0	0.02	605.3	85.17
LESS MOLLUSCS	1,127.7	0.29	113.8	0.08	196.1	0.08	1,144.5	0.61	24.0	0.02	503.0	0.22

Differences were also noted in drift biomass, with higher mean biomass recorded for the upper sites. The relatively low mean biomass (1.3 g) in the upper spring samples was a reflection of the numerous cladocerans collected in the spring drift; the high biomass at the lower site was caused by the large numbers of freshwater clams (15.2% by number) in the drift samples (Tables 6.4 and 6.5).